



CHEMICAL-RESISTANCE PRESSURE  
TRANSMITTER WITH DISPLAY  
**Model KL95**



**Instruction manual**

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# HANDLING PRECAUTIONS

The Model KL95 pressure transmitter is thoroughly tested at the factory before shipment. When this instrument is delivered, perform a visual ascertain that no damage occurred during shipment.

This section describes important cautions in handling this instrument. Read carefully before using it.

If you have any problem or questions, contact your sales agent or Malema.

1. Do not apply more than the maximum allowable pressure. Human injury or damage to surroundings may result due to burst or blow-up of the pressure elements.
2. Do not use these devices on measured objects which are corrosive to fluid or gas contacting areas. Human injury or damage to surroundings may result due to burst or blow-up of the pressure elements and exposure of dangerous measured objects.
3. Do not apply excessive weight, vibration or shock. Human injury or damage to surroundings may result due to burst or blow-up of these devices and exposure of dangerous measured objects.
4. Use with the unspecified power supply may cause fire hazard or electric shock.
5. Use with the instrument temperature range. Use outside the instrument temperature range may cause human injury or damage to surroundings due to burst or blow-up of the devices.
6. Connect wiring accurately according to the wiring drawings or instructions in the operation manual. Incorrect wiring may result in human injury or fire hazard.
7. Use devices with an explosion-proof construction when operating in places liable to have explosive gas, or otherwise runs the danger of explosion.
8. If the measured object is oxygen, use devices with anti-oil treatment. Standard devices may possibly contain remaining oil, and there is danger of combustion and explosion if oil reacts with oxygen.
9. Accurately install these devices according to the installation instructions in the operation manual.
10. Never attempt to neither reconstruct the main body of devices nor add any new function to the devices, etc. Contact us for repairs.
11. For applications where a failure, a malfunction or other defect of this product might result in a serious damage, accident, etc., use multiple units of this product and configure protective circuits [1 out of 2], [2×(1 out of 2)], [2 out of 3]etc. according to their importance.

Note: Please contact Malema Sensors in advance when using these products may possibly result in fatal or serious injury due to malfunction or incorrect operation of these products.

## Overview

This product is an electrical capacitance pressure transmitter using a ceramic diaphragm in the pressure-detecting element. Wetted parts are made of all fluorocarbon resin and employ O-ring-free structure, which is devised as to minimize the generation of contaminant and the elution of metal.

## Caution

**Malema cannot be taken responsible for damage or physical injury caused by the followings;**


- **Repairs or alterations by other companies**
- **Use of products from other companies that cause damage**
- **Use of non authorized parts for maintenance causing damage**
- **Non compliance with the precautions in these instructions or improper use service conditions**
- **Fire, earthquake, water damage or other natural disaster**

**The 5 points here need to check thoroughly.**

- **Chemicals**

When chemical is used as the object fluid to measure, use this instrument in the range that the chemical does not corrode or permeate the material of the wetted part of the sensor. In addition, the service life when used with chemicals greatly depends on the working conditions, including the concentration of chemical, temperature and pressure. Especially when this instrument is to be used with strong acid or strong alkali, consult malema sensors. Resistance data against individual chemical requires a separate test. Sufficiently execute confirmation test under actual operating conditions before use.

- **Storage**

 Caution	Any place that water can reach.
	Any place where there can be a negative influence of atmosphere, temperature, humidity, poor ventilation, sunlight, dust, salty or sulfuric air.
	Any place where there is vibration or shock including during transportation).
	Any place where chemicals are stored or where there are releases of gas.
	In direct sunlight or inside a hot vehicle.

- **Maintenance**

In general, according to the using condition, conduct a periodical inspection about twice a year. Should any abnormality be recognized, contact malema sensors.

Check Items:

- Visual inspection
- Pressure inlet for corrosion, dirt, clogging, leak, etc.
- Check the output with a standard pressure gauge.

# Standard Specifications

Material of wetted parts		PFA / PTFE
Material of case	Body	PFA/PTFE
	Display case	Polypropylene, PET
Pressure Range (Maximum display value)		0 to 50psi (50.0), 0 to 75psi (75.0)
Allowable maximum pressure		105psi
Display (LED 4 digits)	Accuracy	±1% F.S. ±1 digit
	Rate	0.2 seconds
Temperature coefficient		±0.05% F.S. /deg.C
Power and supply current		24VDC ±10% (30mA DC max.)
Comparator output	Open collector	2 outputs of type NPN (30V DC, 10mA max.)
	Response time	Within 5ms
Analog output	Voltage output	0 to 10V DC
	Current output	4 to 20mA
	Output accuracy	±1% F.S.
	Response time	Within 50ms
Connection types		Flaretek, Super Pillar 300, Tube Ends
Connection sizes		1/4", 3/8", 1/2", 3/4"
Operating fluid temperature range		10 to 60 deg.C
Operating humidity range		35 to 85% RH (non-condensing))
Protection		IP54 (an atmosphere release hole exists)
Cable length		4m
Weight		280g
Dead Space		0.67cc

## Installation

To prevent the product from malfunctioning or deteriorating, be sure to avoid installing it in the following places:

- Places where temperature is high
- Places where temperature is low
- Places where corrosive or volatile gas is involved
- Places where strong vibration occurs
- Places where high noise exists
- Places where thunder is likely to hit
- Places that are splashed with liquid or submerged
- Mounting position where the process connection faces vertically upward

# Connection

## Electric Connection

Colored cables are used as described below. Confirm the connection before power is on. Warm up the unit and allow it to stabilize for about five minutes after powered before adjusting the zero point and start measurements.

- (1) Standard (no analog output)
  - Brown - Power source (+)
  - Blue - Power source (-)
  - Black - Open collector output 1
  - White - Open collector output 2
- (2) With 4 to 20 mA DC, 1 to 5 VDC, 0 to 10 VDC output
  - Brown - Power source (+)
  - Blue - Common for power source (-) and analog output (-)
  - Black - Open collector output 1
  - White - Open collector output 2
  - Orange - Analog output (+)

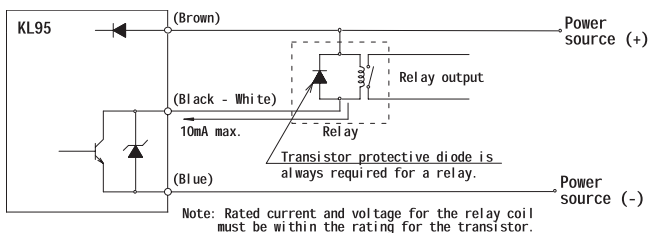
# Internal Type

Output Type: The comparator output comprises open collector output. The analog output comprises 4 to 20 mA DC current output or 1 to 5 VDC, 0 to 10 VDC voltage output.

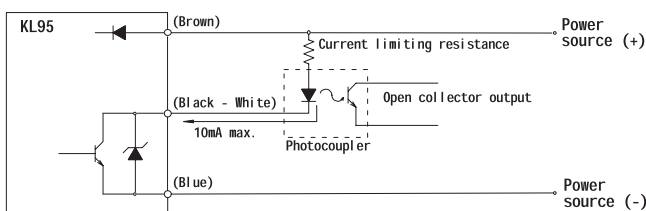
“Open collector” means that the collector of an output transistor is open for the user to use for any desired user defined application. Accordingly, the user is free to use the open collector output in any way. Three typical applications are described below.

The output transistor is rated for 30 VDC, 10 mA. Be sure not to exceed this rating.

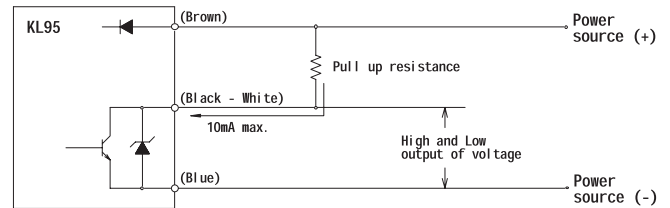
(1) An example of use of open collector (relay connection)



(2) An example of use of open collector (photocoupler connection)

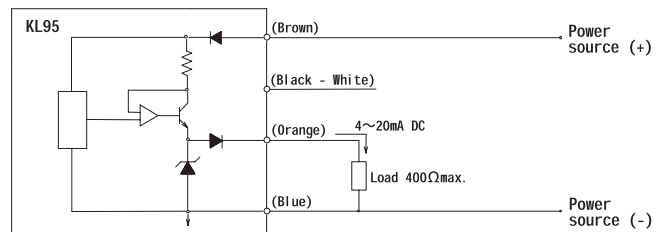


(3) An example of use of open collector (voltage output)

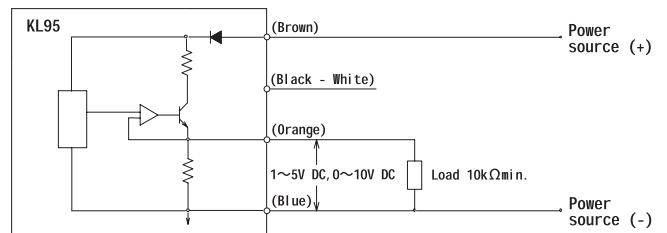


(4) An example of electric connection that includes an analog output (4 to 20 mA DC)

This is exclusively used as source. Never connect to the power source (+) .



(1 to 5 V DC, 0 to 10 V DC)



### • Power Lines

Noise on the power lines can cause fluctuating pressure indication and incorrect operation. Check the cable routing for the DC power lines and use a power source of a high noise removal rate.

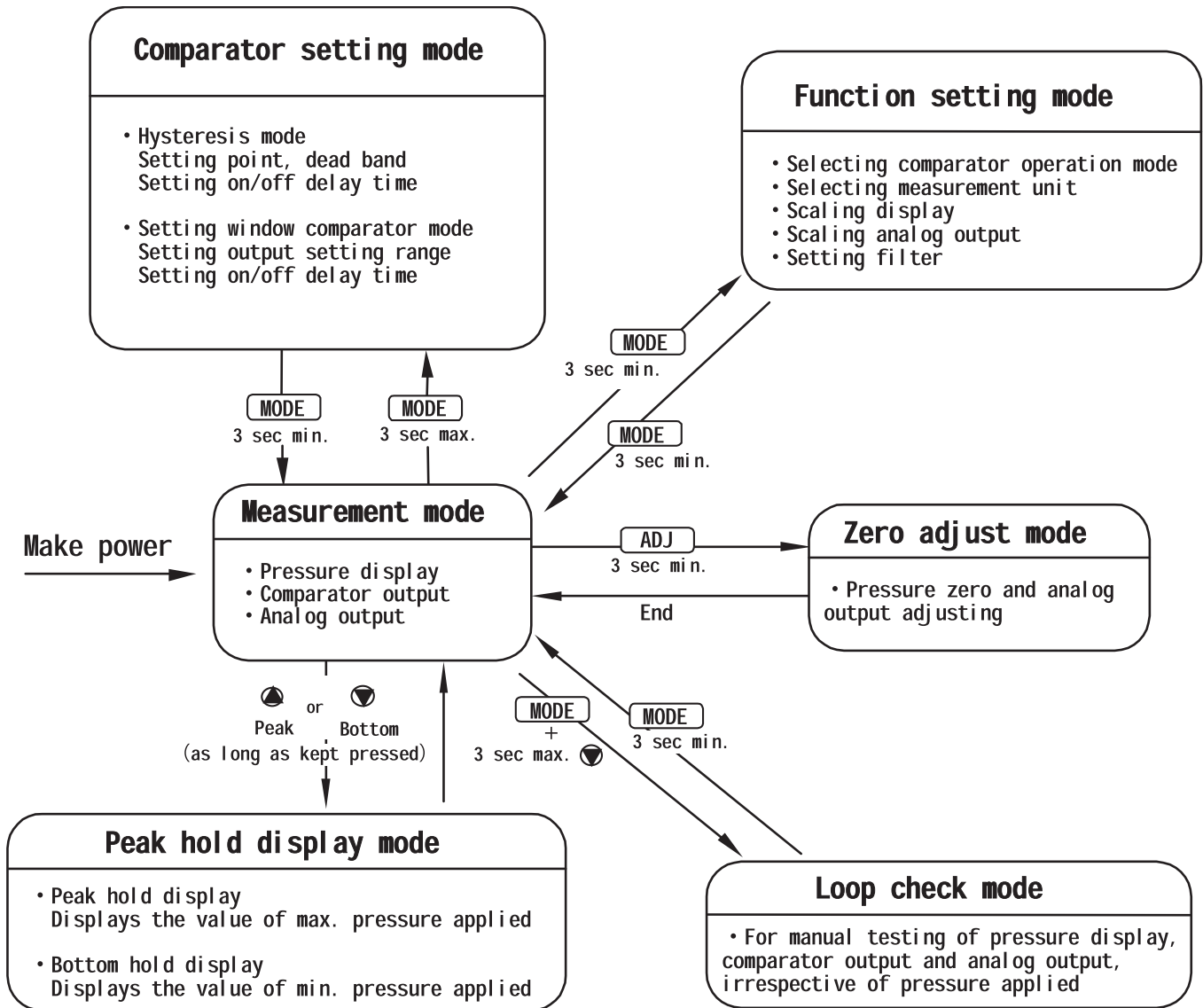
### • Output Lines

The internal circuit of the open collector output is connected to that of the output line. Take a special care when routing the wires and make the wires as short as possible.

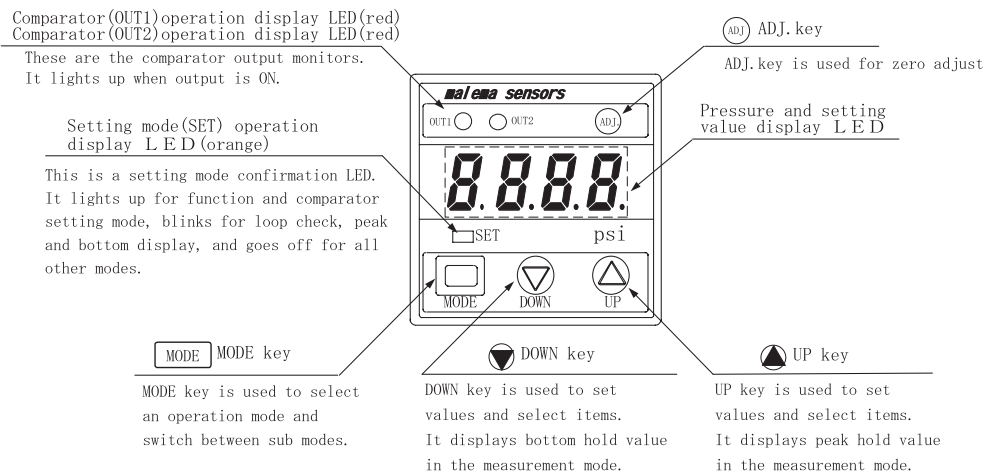
### • Induced Noise

The unit may operate erroneously when subjected to external induction. Keep off a noise source, change the direction, or provide a magnetic or static shield, etc.

# Mode and Their Function



## Panel Functions Selecting Comparator Operation Mode

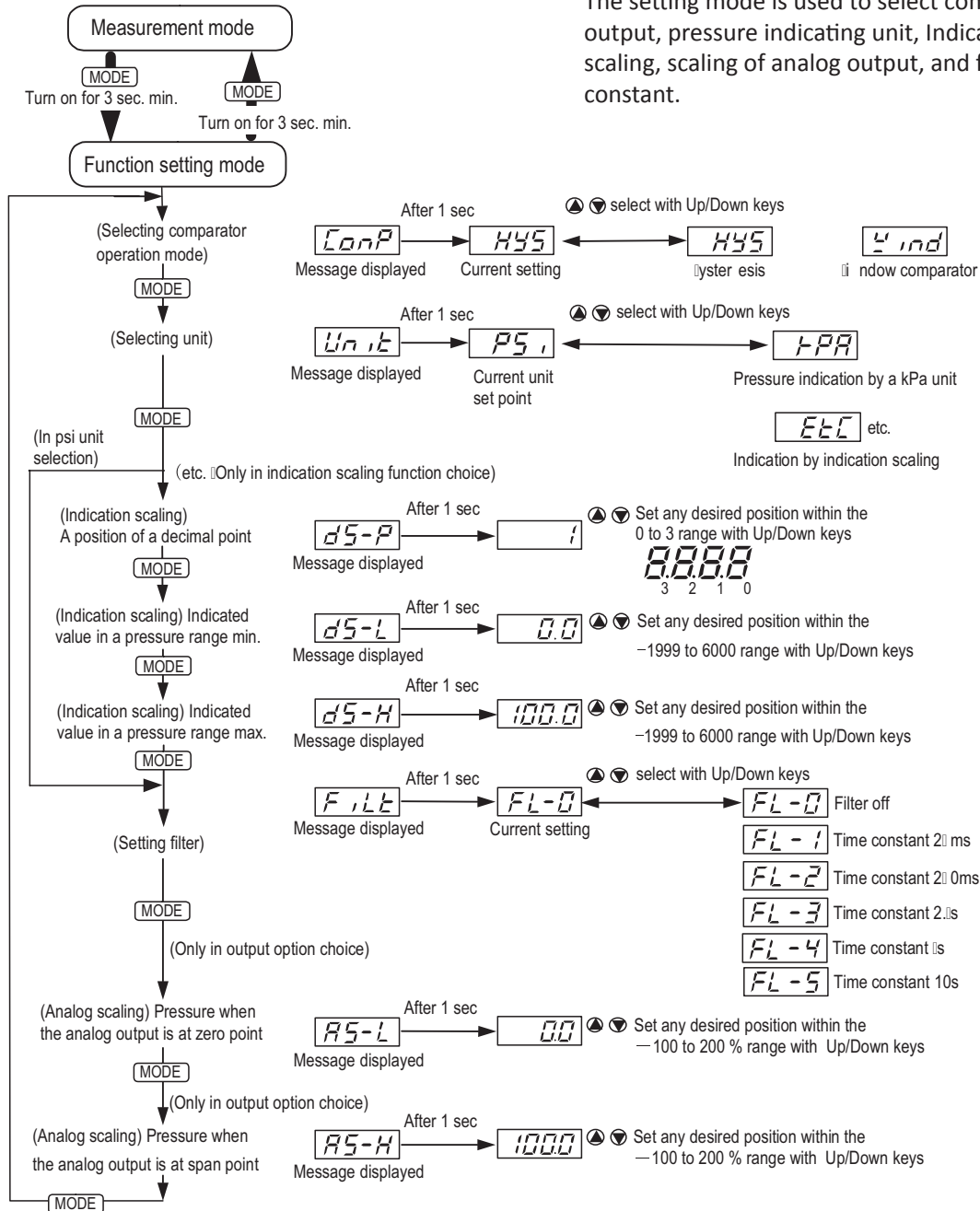


## • Selecting Basic Functions setting procedure

The function-setting mode is called up when you press the Mode key in the measurement mode for more than 3 seconds.

The SET LED lamp lights up.

The setting mode is used to select comparator output, pressure indicating unit, Indication scaling, scaling of analog output, and filter time constant.



## • Selecting Comparator Operation Mode

Select "Selecting Comparator Operation Mode" with the **MODE** key. The message **CONP** is displayed for one second and then the current operation mode is displayed. Select either Hysteresis or Window Comparator Operation with the Up/Down keys.

## • Choice of indication

Select "Selecting Unit" with the **MODE** key. The message **UNIT** is displayed for one second and then the current unit is displayed. Select pressure indication by a psi unit, either pressure indication by indication scaling with an UP/DOWN key.

- **Pressure range and the indication max.**

Pressure range ( psi )	Indication max.	Indication scaling
		psi
0~50	50.0	

- **Scaling LED Indication**

When the operator selects  $\boxed{EEL}$  in the selection of unit, the LED value for applied pressure is scaled to any desired value. This function is used to scale the LED value for min./max. pressure range value. It does not affect the relation between applied pressure and analog output. Select "Indication Scaling" with the  $\boxed{MODE}$  key. The message is displayed for one second and then the decimal position for the current pressure Indication  $\boxed{dS-P}$  is displayed. Change the value with the Up/Down keys. Set the Indication value for min. and max. pressure range in like manner using the Mode and Up/Down keys. The Indication value for the min./max. pressure range is stored internally as arithmetic coefficients. From this time on, whenever you select the unit  $\boxed{EEL}$ , the value is scaled by this coefficient and LED displayed.

Example: The 0.0 to 50.0 psi indication for pressure range 0 to 50 psi (0 to 100%F.S.) is changed to the 0 to 100 indication.

- $\boxed{dS-P}$  Position of decimal point  
(from the least digit) : 1  $\rightarrow$  0
- $\boxed{dS-L}$  Indication value for minimum  
pressure range : 0  $\rightarrow$  0
- $\boxed{dS-H}$  Indication value for maximum  
pressure range : 50  $\rightarrow$  100

- **Setting Filter**

The KL95 Chemical-Resistance Pressure Transmitter with Display incorporates a digital filter with five time constants. Use the filter when pressure changes considerably, making it difficult to read the indication. The selected filter will be reflected in the comparator and analog output.

Select "Setting Filter" with the  $\boxed{MODE}$  key.  $\boxed{FLt}$  message is displayed for one second and then the current setting is displayed. Select a new filter time constant with the Up/Down keys.

- $\boxed{FL-0}$  ..... No filter
- $\boxed{FL-1}$  ..... 25 ms time constant
- $\boxed{FL-2}$  ..... 250 ms time constant
- $\boxed{FL-3}$  ..... 2.5 s time constant
- $\boxed{FL-4}$  ..... 5 s time constant
- $\boxed{FL-5}$  ..... 10 s time constant

- **Scaling Analog Output (factory shipping option)**

This mode is used to set a pressure corresponding to analog output zero point (4 mADC, 1 VDC, 0 VDC) /span point (20 mADC, 5 VDC, 10 VDC) .

Select "Analog Scaling" with the  $\boxed{MODE}$  key. A message  $\boxed{RS-L}$  is displayed for one second and then the pressure corresponding to the current analog output zero point (4 mADC, 1 VDC, 0 VDC) is displayed in a percentage of the full scale of the pressure range. Enter the desired value with the Up/Down keys. Set the pressure for analog output span point  $\boxed{RS-H}$  in like manner using the  $\boxed{MODE}$  key and Up/Down keys.

Example: The unit of 0 to 10 VDC output with pressure range 0 to 50 psi (0 to 100%F.S.) is changed to 0 to 10 VDC output with 0 to 47.5 psi.

- $\boxed{RS-L}$  Pressure at analog output  
zero point : 0.0%F.S.  $\rightarrow$  0.0%F.S.  
(will output 0 VDC with pressure range 0%F.S.)
- $\boxed{RS-H}$  Pressure at analog output  
span point : 100.0%F.S.  $\rightarrow$  95.0%F.S.  
(10 VDC with pressure range 95.0%F.S.)

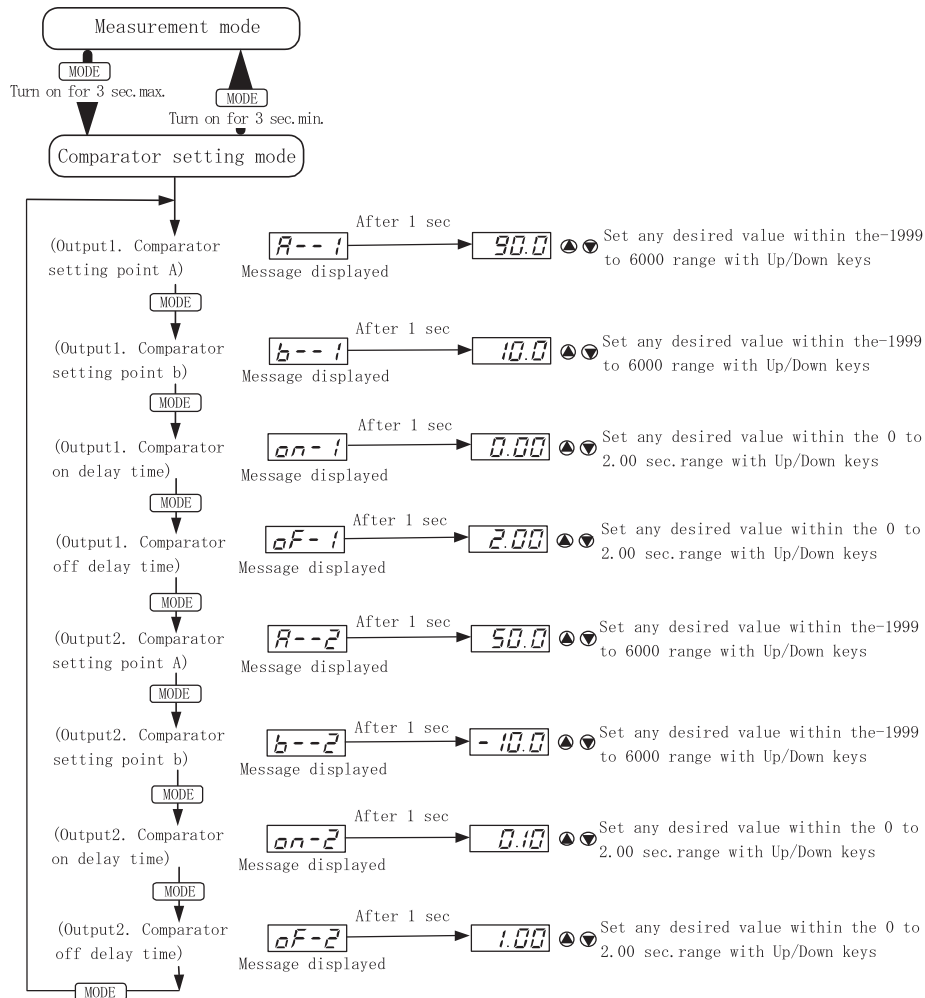


## • Comparator Setting Setting Procedure

The comparator incorporates two points of OUT1 and OUT2. or each of them, you may collectively select and set two kinds of operation modes of “Hysteresis (upper/lower limits)” and “Window Comparator.” For both modes, you may set a maximum of two seconds of On/Off delay time for OUT1 and OUT2 individually. When the comparator output conditions are satisfied as described below, respective outputs enter into the ON state and the Monitor LED (OUT1, OUT2) is lighted.

Press the Mode key (release within three seconds) in the measurement mode to enter into the comparator setting mode. The Selected lamp lights up.

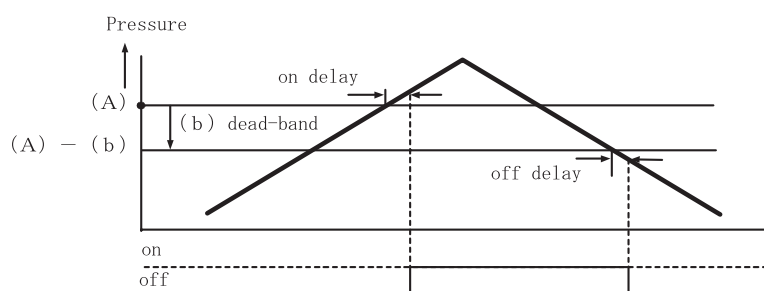
This mode is used to set operating pressure for comparator outputs. The values entered in this mode will become “A” and “b” of hysteresis and window comparator selected in the function setting mode (selection of comparator operation mode).



## • Comparator Operation Setting Procedure

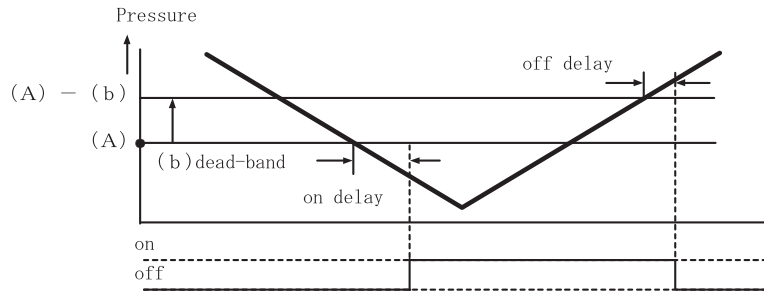
### • Setting the upper limit

This is the mode in which the comparator operates with the setting item (A) as the upper limit. The upper limit setting is determined when you select a positive figure (including 0) for setting item (b) .

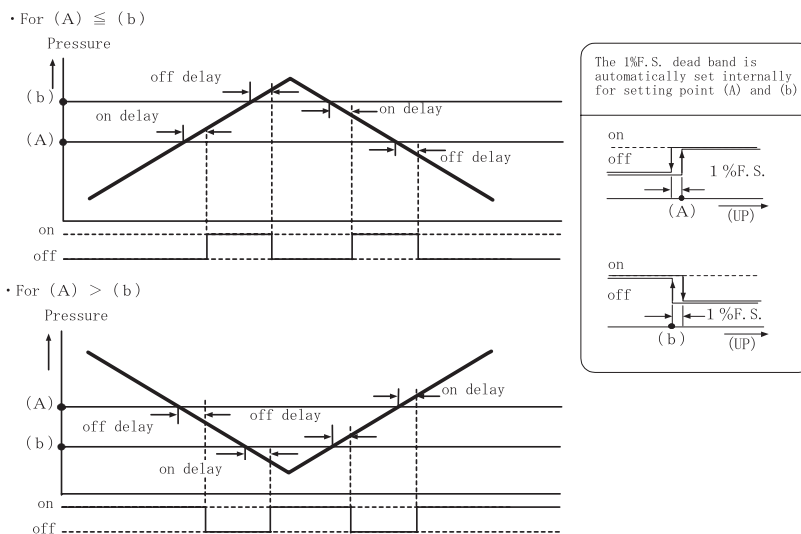


• Setting the lower limit

This is the mode in which the comparator operates with the setting item (A) as the lower limit. The lower limit setting is determined when you select a negative figure for setting item (b).



• Operation of Window Comparator



• Factory shipping value

	Setting item	Setting value	Selecting range
1	Selection of comparator operation mode	Hysteresis mode	Hysteresis mode
			Window mode
2	Selection of indication	psi	psi kPa
3	Indication scaling	50.0	-1999 ~ 6000
4	Setting filter	FL-0 (No filter)	FL-0(No filter) FL-3(2500ms)
			FL-1(25ms) FL-4(5000ms)
			FL-2(250ms) FL-5(10000ms)
5	Analog scaling	Pressure at zero point	0.0 (%)
		Pressure at span point	100.0 (%)
6	Comparator setting 1	Setting point	50 %F.S.
		Dead band	10 %F.S.
		On delay	0.00 (sec)
		Off delay	0.00 (sec)
	Comparator setting 2	Setting point	50 %F.S.
		Dead band	-10 %F.S.
		On delay	0.00 (sec)
		Off delay	0.00 (sec)
7	Hysteresis of window comparator	1 %F.S.	
8	Outside of pressure range	Upper limit	110 %F.S.
		Lower limit	-10 %F.S.
9	Outside of adjusting the zero point	± 10 %F.S.	

## • Other Functions

### • Basic Key Operations

In all setting mode, values are set with the ▲▼ keys. Use ▲ key to increase and ▼ key to decrease the value. Values continuously increase or decrease in three different speeds of choice when ▲▼ key is held for more than 0.5 seconds. ▲▼ keys are also used for setting comparator, unit and filter in the function setting mode.

Do not use a needle or other pointed items to operate the keys.

### • Adjusting the Zero Point

Adjusting the Zero Point When setting is at Measurement mode, and KL95 is not connected to process line (as the pressure should be equal to atmosphere) release the hand after holding [ADJ.] key for three seconds (until SET LED is flashing). KL95 will automatically adjust its zero point after approximately one second, and the indicated pressure shall be zero.

[ORd.] will be displayed when zero point adjustment is complete. An error [Err] sign will be displayed for one second indicating that zero adjustment is incomplete, when exerted pressure is outside  $\pm 10\%$ F.S. of range.

### • Loop Check

The operator can manually test pressure indication, analog outputs and comparator with the ▲▼ keys irrespective of the pressure applied. This may be used for simulation of wiring check for analog outputs, comparator outputs, etc.

Press the [MODE] key + ▼ key in the measurement mode. A message [Loop] is indicated for one second, indicating that you have entered into the loop check mode. The Selected light blinks.

The operator can change the pressure indication value manually with the ▲▼ keys. The analog and comparator outputs also vary in accordance with the Indication. Press the [MODE] key for more than three seconds to return to the measurement mode.

### • Peak Hold

The KL95 unit keeps the maximum and minimum pressure level applied to the pressure port as peak and bottom value, respectively, in the internal memory. The peak and bottom values are displayed as long as you press and keep pressed the ▲ and ▼ keys, respectively. When you select this operation, a message [PEAK] is displayed for one second and "SET LED" lamp blinks.

Peak and bottom values can be reset when KL95 is re-powered up or by the following procedure;

Resetting peak value: While pressing and holding ▲ key,  
press ▼ key

Resetting bottom value: While pressing and holding ▼ key,  
press ▲ key

### • Key Lock

You may nullify the key operations to prevent inadvertent overwriting of setting values.

Once the key lock is set, the function setting, comparator setting, zero point adjustment, and loop check modes cannot be accessed. The key lock cannot be re-set by re-powering KL95. It can only be reset by the following unlocking procedure.

Press [MODE] key + ▲ key in the measurement mode. A message [Lock] is displayed for one second, indicating that the unit has entered into the key lock state.

To reset, also press [MODE] key + ▲ key. A message [Unlck] is indicated for one second, indicating that the unit is unlocked.

### • Error Indication

An error message and a measuring pressure are alternately displayed when one of the following occurs while it is in Measurement mode or Loop Check mode.

Error display	Contents	Action
[FFF]	A pressure equal to or above 110%F.S. of sensor range is applied Or when indicated value exceeded 6000	Reduce pressure to rated range
[-FFF]	A pressure equal to or above -10%F.S. of sensor range is applied Or when indicated value exceeded -1999	
[Err]	When, in zero adjustment, it is pressurized pressure of $\pm 10\%$ F.S. range outside of pressure range	Open the unit to the atmosphere and adjust zero point again

- **Backup of set point**

This has EEPROM built-in inside and maintains set point / some active state for power interruption

Setting values stored in memory	States stored in memory
All set point in a function setting mode comparator setting mode	Key lock/unlock